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(52) UK CL (Edition S)

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**G4Q QAJ**  
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(58) Field of Search

**UK CL (Edition R) G3N NGA3 NGA4 NGE1 NGE1A**  
**NGE1B NGE2 NGL NG1A4, G3R RBN29,**  
**G4A AFL, G4H HRE, G4Q QAJ**

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(54) Abstract Title

**Vehicle drive control, speed warning and navigation apparatus**

(57) A vehicle is equipped with a digital audio broadcast (DAB) receiver 102 and a global positioning system (GPS) receiver 104. The DAB receiver 102 receives a signal which comprises data constituting information relating to terrain, such as road surface conditions, location of bends, gradients, or relating to traffic information, or local speed limits. A processing means 200 uses the GPS data to determine vehicle location, and then extracts the relevant information from the DAB signal. This can then be used either to alert the driver to local speed limits, or to present local traffic information, or to control one or more vehicle functions, such as a cruise control system, traction control, an automatic gearbox, a suspension damping control system or ride height control system. The DAB receiver can also be used to receive software updates for the navigation system or for a vehicle management system 204.

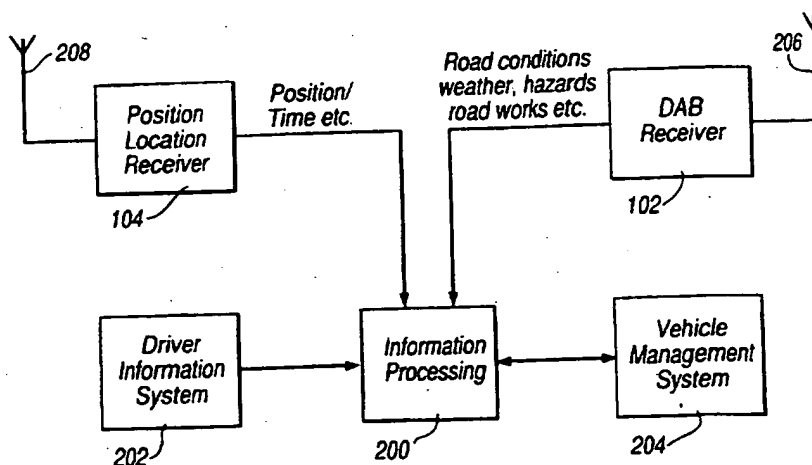


Fig.2

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21/26 21/28 21/30 21/32 21/34 21/36 , G05D 1/02 13/00  
13/02 , G06F 9/445 , G07C 5/00 , G08G 1/09 1/0962  
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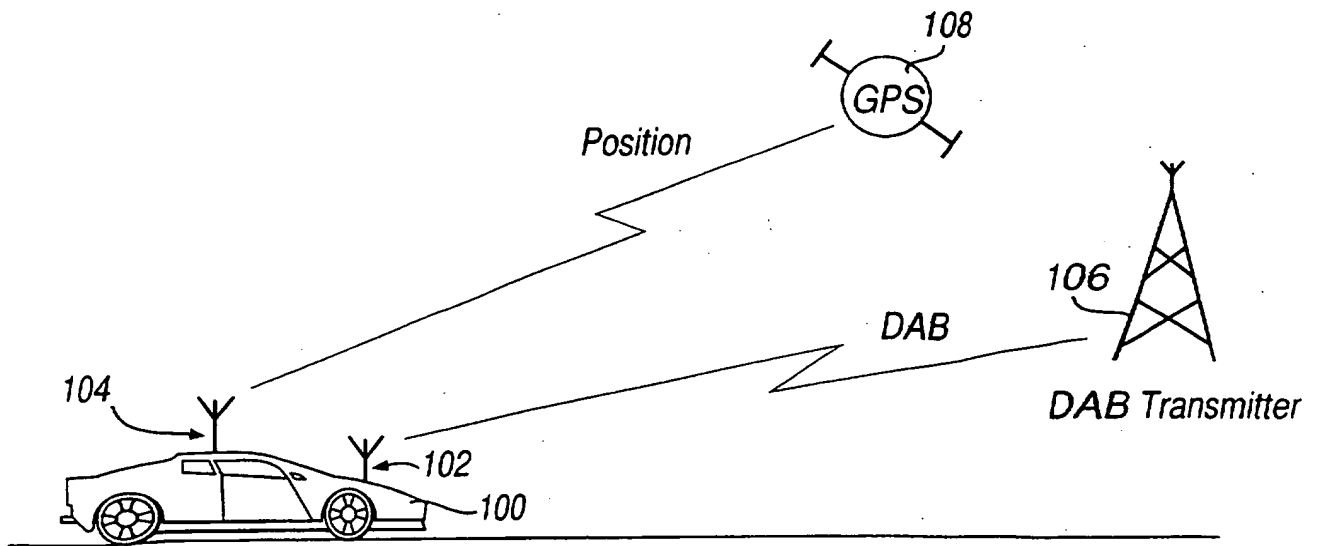


Fig. 1

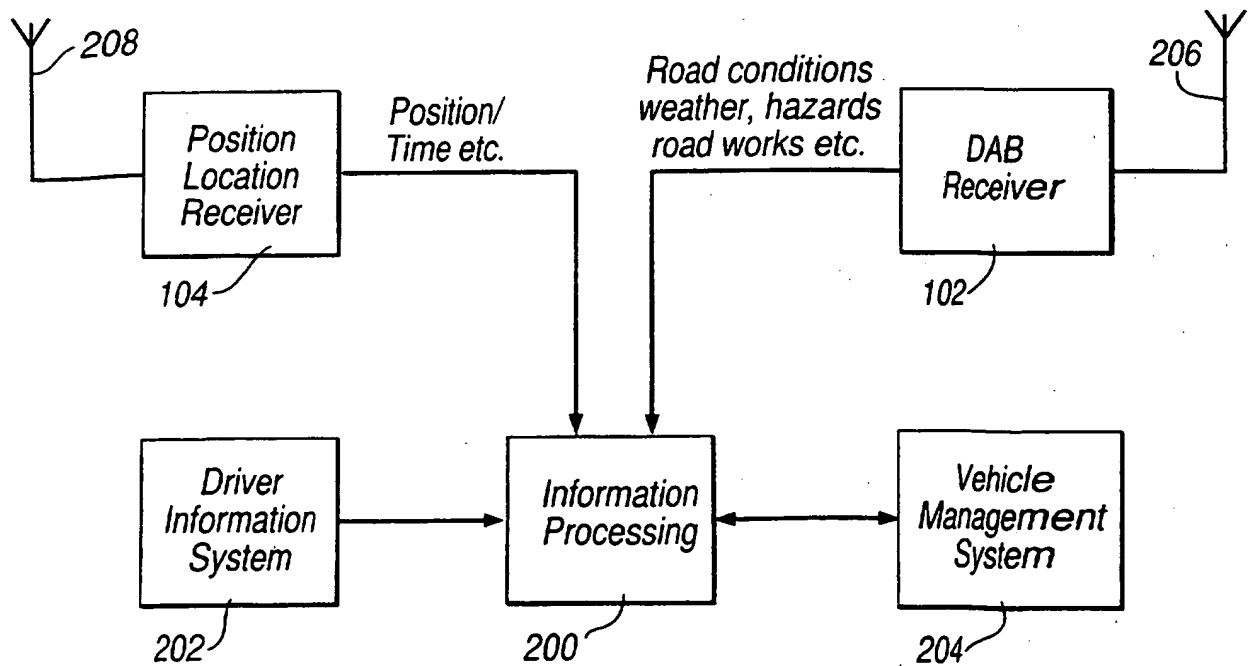


Fig. 2

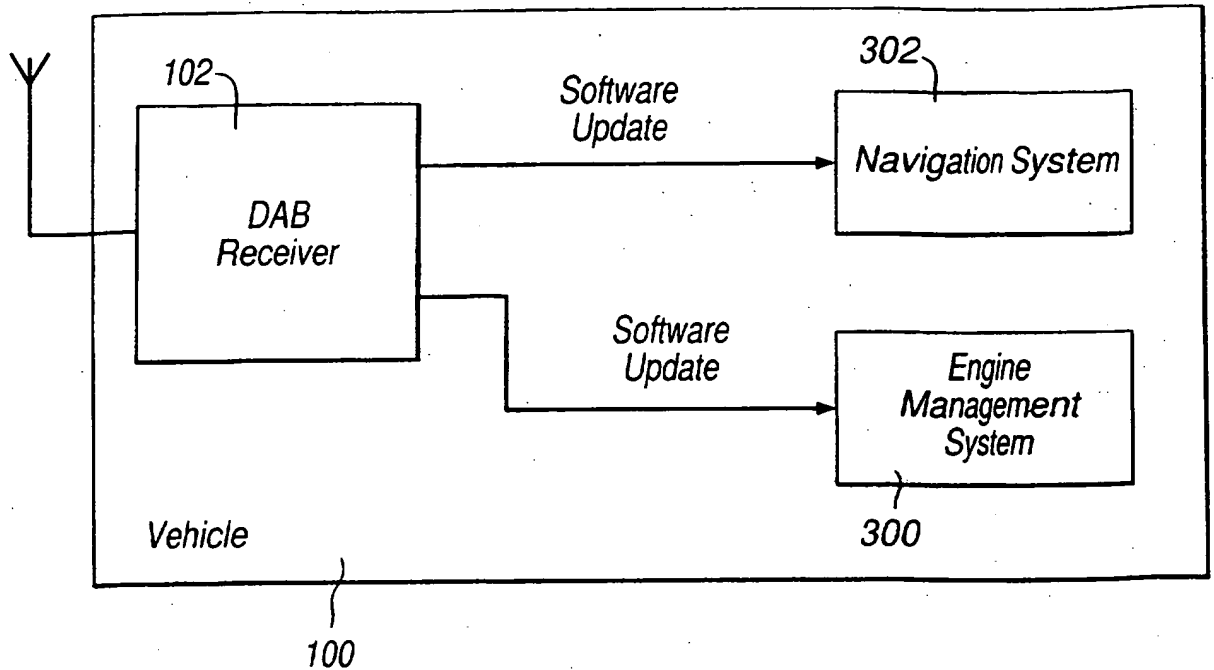


Fig.3

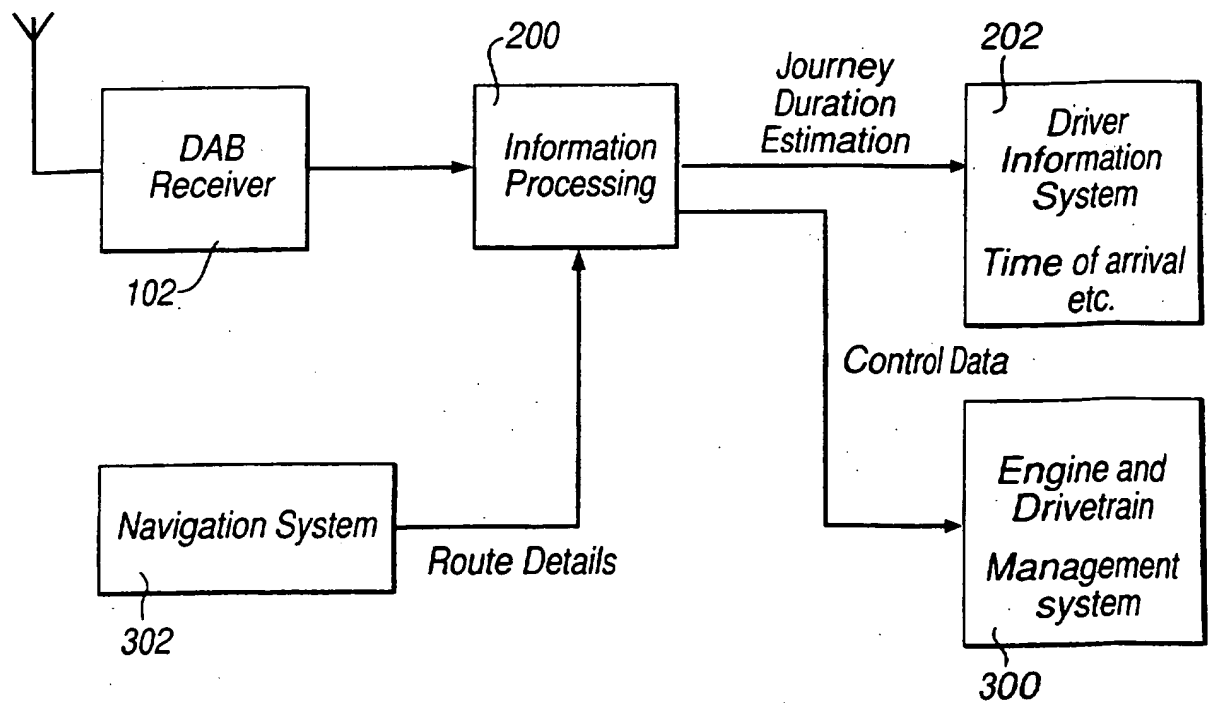


Fig.4

## **VEHICLE ACCESSORY CONTROL APPARATUS, VEHICLE SPEED WARNING APPARATUS AND VEHICLE NAVIGATION APPARATUS**

The present invention relates to a vehicle drive feature control apparatus, vehicle speed warning apparatus and vehicle navigation apparatus of the type used in a vehicle to control the ride in a vehicle.

In a motor vehicle, such as a automobile, it is known to provide accessories, for example, cruise control, traction control, vehicle ride height control, automatic gearbox control, and automatic suspension control. These accessories are usually controlled by an engine management system resident in the vehicle and coupled to the accessories.

It is an object of the present invention to provide an improved apparatus for controlling the vehicle accessories in order to provide improved vehicle operation and performance.

According to a first aspect of the present invention, there is provided an apparatus for controlling operation at least one vehicle accessory comprising: a DAB receiver for receiving a digital audio broadcast signal; means for determining the location of a vehicle, and a processing unit arranged to extract information relating to the terrain in the vicinity of the vehicle based upon the location of the vehicle, and to adjust the operation of the at least one vehicle accessory in response to the information relating to the terrain.

The at least one vehicle accessory may be a suspension damping control system, a vehicle ride height control system, an automatic cruise control system or an automatic gearbox control system.

According to a second aspect of the present invention, there is also provided a vehicle speed warning apparatus comprising: a DAB receiver for receiving a

digital audio broadcast signal; means for determining the location of the vehicle; a processing unit arranged to extract speed limit information relating to the position of the vehicle, and an output device for alerting a driver of the vehicle as to the speed limit.

Preferably, the output device alerts the driver of the vehicle as to the speed limit in response to the vehicle travelling faster than the speed limit.

According to a third aspect of the present invention, there is also provided a vehicle navigation apparatus comprising: a DAB receiver for receiving a digital audio broadcast signal; means for determining the location of the vehicle and the direction of travel of the vehicle; a processing unit arranged to extract traffic information pertinent to the position and direction of travel of the vehicle, an output device arranged to output the extracted traffic information pertinent to the position and direction of travel of the vehicle.

Preferably, the traffic information relates to traffic conditions immediately preceding the vehicle en route.

The vehicle navigation apparatus may further comprise means for influencing the determination of an estimated time of arrival of the vehicle to a destination based upon the traffic information received.

Preferably, the means for determining the location of the vehicle is a Global Positioning System (GPS) receiver.

According to a fourth aspect of the present invention, there is also provided an apparatus for updating software in an electronic device, comprising: a DAB receiver for receiving a digital audio broadcast signal; means for identifying and extracting data contained in the digital audio broadcast signal constituting software; and communication means for transmitting the extracted data to the electronic device.

The electronic device may be a vehicle management system or may be a vehicle accessory.

It is thus possible to provide a vehicle accessory control apparatus having improved performance and operation.

At least one embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a schematic diagram of apparatus for use with an embodiment of the present invention;

Figure 2 is a schematic diagram of an apparatus constituting an embodiment of the invention;

Figure 3 is a schematic diagram of an apparatus constituting another embodiment of the invention; and

Figure 4 is a schematic diagram of an apparatus constituting a further embodiment of the invention.

Throughout the following examples, reference will be made to vehicle management systems. Such systems can provide at least one or more of, but are not limited to, the following functionality: vehicle management, engine management, and/or drivetrain management.

Referring to Figure 1, a vehicle 100 equipped with a Digital Audio Broadcast (DAB) receiver 102 and a position location unit, such as a Global Positioning System (GPS) receiver 104 is capable of receiving DAB signals from a DAB transmitter 106, and GPS signals from a GPS satellite 108, respectively.

A processing unit 200 (Figure 2) is coupled to the DAB receiver 102, the GPS receiver 104, a driver information system 202 and a vehicle management system 204. The DAB receiver 102 and the GPS receiver 104 are coupled to a first antenna 206 and a second antenna 208, respectively.

In operation, position data relating to the position of the vehicle 100 is received by the GPS receiver 104 for use by the processing unit 200. DAB signals constituting data are received by the DAB receiver 102 for use by the processing unit 200 as well.

The DAB signal received contains terrain-related information, for example, road surface conditions, the location of bends, the location and degree of gradients, traffic conditions, and/or extant temporary or permanent speed limits. The terrain-related information received by the DAB receiver also contains location information associated with the terrain-related information. Consequently, the terrain-related information is location specific.

Based upon the position data received by the GPS receiver 104, the processing unit 200 extracts the terrain-related information that is relevant to the current location of the vehicle 100.

In response to the location specific terrain-related data extracted, the processing unit 200 instructs the vehicle management system 204 to adjust the operation of at least one vehicle accessory. For example, knowledge of a gradient which lies ahead on the route followed by the vehicle allows the processing unit 200 to instruct the vehicle management system 300 to select an appropriate gear ratio at or before the appropriate location by means of an automatic gearbox control. The vehicle accessories can include, but are not limited to: cruise control, traction control, vehicle ride height control, automatic gearbox control, and automatic suspension control.

In another embodiment, the data received by the DAB receiver 102 comprises location specific speed limit information, i.e. information related to speed restrictions in place at a given location. In response to the position data received by the GPS receiver 104, the processing unit 200 extracts the speed limit information pertinent to the position of the vehicle 100 and communicates the



speed limit information to the driver information system 202. The driver information system 202 consequently alerts a driver of the vehicle, either audibly, visually or both, as to the speed limit in force at the vehicle's current location. Alternatively, the processing unit 200 can receive vehicle speed information from the vehicle management system 204 and only communicate the speed limit information to the driver information system 202 in the event that the vehicle speed exceeds the speed limit constituting the speed limit information.

In another embodiment of the invention, the position data received by the DAB receiver 104 is used to determine the direction of travel of the vehicle. The data received by the DAB receiver 102 comprises traffic information and associated location information, i.e. information relating to traffic conditions at specific locations. Based upon the position and direction of travel of the vehicle 100, the processing unit 200 extracts traffic information from the data received by the DAB receiver 104 relating to traffic conditions which lie en route immediately ahead of the vehicle 100, for example, less than 1.6 km (1 mile) ahead of the vehicle 100.

In another embodiment of the invention (Figure 3), the DAB receiver 102 is coupled to an vehicle management system 300 and a navigation system 302. The data received by the DAB receiver 102 contains data corresponding to software updates for at least one of the vehicle management system 300 or the navigation system 302. The data received by the DAB receiver 102 containing the updated software is detected by the navigation system 302 or the vehicle management system 300 and downloaded in order to update the software of the respective appropriate system.

In another embodiment of the invention, the processing unit 200 is coupled to the DAB receiver 102, the driver information system 202, the navigation system 302 and the vehicle management system 300.

In operation, the processing unit 200 receives data received by the DAB received 102 containing traffic information and associated location information, i.e. information relating to traffic conditions at specific locations. The processing unit 200 also receives route details from the navigation system 302 relating to a route being followed by the vehicle 100 to a destination. Based upon the position of the vehicle along the route being followed, the processing unit 200 can extract traffic information relevant to the route being followed by the vehicle and determine the effect any traffic conditions may have upon the time that the vehicle 100 will take to reach the destination. Consequently, the processing unit 200 calculates the time of arrival of the vehicle 200 based upon the traffic information extracted. The calculated time of arrival is subsequently communicated to the driver of the vehicle by means of the driver information system 202 described above.

## CLAIMS

1. An apparatus for controlling operation at least one vehicle accessory comprising:
  - a DAB receiver for receiving a digital audio broadcast signal;
  - means for determining the location of a vehicle, and
  - a processing unit arranged to extract information relating to the terrain in the vicinity of the vehicle based upon the location of the vehicle, and to adjust the operation of the at least one vehicle accessory in response to the information relating to the terrain.
2. An apparatus as claimed in Claim 1, wherein the at least one vehicle accessory is a suspension damping control system.
3. An apparatus as claimed in Claim 1, wherein the at least one vehicle accessory is a vehicle ride height control system.
4. An apparatus as claimed in Claim 1, wherein the at least one vehicle accessory is an automatic cruise control system.
5. An apparatus as claimed in Claim 1, wherein the at least one vehicle accessory is an automatic gearbox control system.
6. A vehicle speed warning apparatus comprising:
  - a DAB receiver for receiving a digital audio broadcast signal;
  - means for determining the location of the vehicle;

a processing unit arranged to extract speed limit information relating to the position of the vehicle, and

an output device for alerting a driver of the vehicle as to the speed limit.

7. An apparatus as claimed in Claim 6, wherein the output device alerts the driver of the vehicle as to the speed limit in response to the vehicle travelling faster than the speed limit.

8. A vehicle navigation apparatus comprising:

a DAB receiver for receiving a digital audio broadcast signal;

means for determining the location of the vehicle and the direction of travel of the vehicle;

a processing unit arranged to extract traffic information pertinent to the position and direction of travel of the vehicle,

an output device arranged to output the extracted traffic information pertinent to the position and direction of travel of the vehicle.

9. An apparatus as claimed in Claim 8, wherein the traffic information relates to traffic conditions immediately preceding the vehicle en route.

10. An apparatus as claimed in Claim 8, further comprising means for influencing the determination of an estimated time of arrival of the vehicle to a destination based upon the traffic information received.

11. An apparatus as claimed in Claim 1, 6 or 8, wherein the means for determining the location of the vehicle is a Global Positioning System (GPS) receiver.

12. An apparatus for updating software in an electronic device, comprising:  
a DAB receiver for receiving a digital audio broadcast signal;  
means for identifying and extracting data contained in the digital audio broadcast signal constituting software; and  
communication means for transmitting the extracted data to the electronic device.
13. An apparatus as claimed in Claim 12, wherein the electronic device is an vehicle management system.
14. An apparatus as claimed in Claim 12, wherein the electronic device is a vehicle accessory.
15. An apparatus for controlling operation of at least one vehicle accessory substantially as hereinbefore described with reference to Figures 1 and 2.
16. An apparatus for updating software in an electronic device substantially as hereinbefore described with reference to Figures 1 and 3.
17. A vehicle navigation apparatus substantially as hereinbefore described with reference to Figures 1 and 4.



Application No: GB 9920331.7  
 Claims searched: 12-14

Examiner: Michael Prescott  
 Date of search: 14 August 2000

## Patents Act 1977 Further Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:  
 UK CI (Ed.R): G4A (AFL); G4H (HRE)  
 Int CI (Ed.7): G06F 9/445; G07C 5/00  
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### Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
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X, Y	EP 0905984 A2	(Matsushita Electric Industrial Co., Ltd.) see paras 001-008	X: 12 Y: 13, 14
X, Y	EP 0895157 A1	(Matsushita Electric Industrial Co., Ltd.) see paras 0002-0005, 0058	X: 12 Y: 13, 14
X, Y	EP 0779716 A2	(Lucent Technologies Inc.) see column 7 lines 19-33	X: 12 Y: 13, 14
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Y	US 5442553	(Parrillo, L C) whole document	13, 14

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Application No: GB 9920331.7  
Claims searched: 8 to 11

Examiner: Michael Prescott  
Date of search: 14 August 2000

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UK Cl (Ed.R): G4Q (QAJ)  
Int Cl (Ed.7): G08G 1/09, 1/0962, 1/0967, 1/0968, 1/0969, 1/133, 1/137; H04H 1/00  
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### Documents considered to be relevant:

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Application No: GB 9920331.7  
Claims searched: 6 and 7

Examiner: Michael Prescott  
Date of search: 14 August 2000

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UK CI (Ed.R): G3N (NGA3, NGA4); G3R (RBN29); G4Q (QAJ)  
Int CI (Ed.7): B60K 31/00; G01C 21/26, 21/28, 21/30, 21/32, 21/34, 21/36; G08G 1/09, 1/0962, 1/0967, 1/0968, 1/0969, 1/133, 1/137; H04H 1/00  
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A	EP 0884709 A2 (Robert Bosch GmbH)	-

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**Application No:** GB 9920331.7  
**Claims searched:** 1-5

**Examiner:** James Porter  
**Date of search:** 19 November 1999

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**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:  
UK CI (Ed.Q): G3N (NGA3, NGA4, NGE1A, NGE1B, NGE1, NGE2, NGL, NG1A4)  
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Other: Online databases: WPI, EPODOC, JAPIO

**Documents considered to be relevant:**

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Y	EP0831255 A1	(EQUOS RESEARCH) See abstract & figure; note p5 lines 1-17	1, 5
Y	WO98/34210 A1	(MANNESMANN) See whole document	1, 4, 5
A	WO98/23918 A1	(TOYOTA)	1, 2, 3
Y	US5911771 A	(BMW) See whole document	1, 5

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